AMENDMENTS TO THE CLAIMS

Claims 1-14 (Cancelled)

15. (Currently amended) The method of Claim [[14]] 73, wherein the cost function parameters ~~selected~~ include [[the]] position gain and [[the]] velocity gain.

16. (Original) The method of Claim 15, wherein the position gain ~~selected~~ includes one of 0 and 1 and the velocity gain ~~selected~~ includes one of 0 and 1.

Claims 17-19 (Cancelled)

20. (Currently amended) The method of Claim [[19]] 73, wherein combinations of the cost function parameters ~~, the input weight, and the predicted future states~~ are considered stable if the sum of a cost function response ~~the control system~~ phase differential and ~~operational~~ a plant phase differential is either between +l50 and +l80 degrees or between -150 and -1 80 degrees, wherein the ~~control system~~ cost function response phase differential is the phase differential between a control input and a control output, and wherein the ~~operational~~ plant phase differential is the phase differential between the plant input and the plant output.

21. (Currently amended) The method of Claim [[19]] 73, wherein more stable combinations of the cost function parameters ~~, the input weight, and the predicted future states~~ are those for which the sum of the ~~control system~~ cost function response phase and the known plant phase is closest to 180 degrees or negative 180 degrees and less stable combinations of the cost function parameters, the input weight, and the predicted future states are those for which the sum of the ~~control system~~ cost function response phase and the known plant phase is closest to 0 degrees.

Claims 23-72 (Cancelled)

73. (New) A method of designing a predictive control system for a dynamic nonlinear plant, the control including a neural network for predicting a state of the plant and a cost function for generating a cost function response u(n) for the plant, the cost function response u(n) generated from parameters including a predicted state by the neural network, the method comprising:

sensing responses of the plant to an input signal that operates the plant at different frequencies;

taking the plant off-line; and

testing different permutations of cost function parameters to determine a viable permutation for the cost function, wherein testing each permutation includes

supplying the input signal to the neural network, and

comparing phases of the cost function responses u(n) to phases of the previously sensed plant responses at corresponding frequencies.

74. (New) The method of claim 73, wherein the input signal is chirped only once for the plant; and wherein the input signal to the neural network is chirped once for each permutation of cost function parameters.

75. (New) The method of claim 74, wherein the chirped input to the plant and the corresponding plant responses are also used to train the neural network.

76. (New) The method of claim 74, wherein the different permutations produce different cost function responses u(n) and wherein the phases of the cost function response u(n) to the chirped input is calculated; and wherein the plant phases are compared to phases of all of the different cost function responses u(n).

77. (New) The method of claim 73, wherein only permutations at resonant frequencies are tested for stability.

78. (New) The method of claim 73, wherein the phases of the plant response and the phases of the cost function response u(n) are in the stable regions shown in Figure 4B.

79. (New) The method of claim 73, wherein AB looping is used to test different permutations of the cost function parameters.

80. (New) The method of claim 73, wherein forget factor looping is used to test different permutations of the cost function parameters.

81. (New) An article for tuning a cost function of a neural predictive control system for a plant, the system including a neural network for providing a predictive state to the cost function, the article comprising computer memory encoded with instructions for causing a computer to test different permutations of cost function parameters to determine a viable permutation for the cost function, each permutation resulting in a cost function response u(n), the testing of each permutation including:

supplying a chirped input to the neural network, the chirped input to the neural network including resonant frequencies of the plant; and

accessing recorded responses of the plant to its resonant frequencies; and
comparing phases of the cost function response u(n) to phases of the plant response.

82. (New) A system comprising:

a plant; and

a predictive control system for the plant, the system comprising at least one processor programmed with a neural network, a cost function for providing a control response to a state provided by the neural network, and code for tuning the cost function, the code causing the at least one processor to record responses of the plant to a chirped input; take the plant off-line; and test different permutations of cost function parameters to determine a viable permutation for the cost function, wherein testing each permutation includes:

supplying a chirped input to the neural network, the chirped input to the neural network being at the same frequencies as the chirped input to the plant, and
comparing phases of the cost function response u(n) to phases of the previously measured plant responses.